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Growth of silicon nano-structures at low temperature and their application in electronic and energy related devices

Shashi Paul, Krishna Nama Manjunatha and Konstantina Saranti
De Montfort University, UK

Silicon is widely used in electronic industries in a number of forms, for example: amorphous silicon is used in liquid-crystal display units; poly-silicon is used in Flash memory structures & photovoltaic solar cells and single crystals are used in C-MOS technologies. Among various forms of silicon embodiments, silicon nano-structures (for example silicon nanowires). However, before silicon nano-structures become integrated into a commercial product (for example in consumer plastic electronics or batteries), there are still major challenges to conquer. These include optimizing growth conditions, low-temperature growth of silicon nano-structures. For the growth of nano-structures, widely employed chemical vapour deposition (CVD) techniques is in practice. However, the growth temperatures relevant to this technique exceed 600°C, which results in very high thermal budgets and process is not compatible cheap and flexible substrates. Using a combination of pre-growth preparation steps and plasma enhanced chemical vapour deposition (PECVD), have been shown to result in the growth of silicon structures (micro and nano sized) $\leq 300^\circ\text{C}$. Using this process, we are able to grow silicon structures on plastic/glass substrates and have demonstrated their use in electronic and energy related devices.

Biography

Shashi Paul is working in the Emerging Technologies Research Centre (EMTERC), De Montfort University, and Leicester, United Kingdom, as a reader in Nanoscience and Nanotechnology and head of EMTERC. He graduated from Indian Institute of Science (IISc), Bangalore and previously worked at Cambridge University, Durham University and Rutgers University. He has extensive experience in the field of deposition of nano-sized organic and inorganic materials in the context of their applications to electronic memory devices, thin film transistors, biological & chemical sensors and energy related devices.

spaul@dmu.ac.uk

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